

## MARKED UP PAGES

Traditionally, trash bags have been manufactured and sold in rolls comprised of individual trash bags connected [end to end] end-to-end. The rolls of end-to-end connected trash bags are packaged in boxes or suitable containers for distribution. Whenever a trash bag is needed, the consumer unwinds the outermost trash bag from the roll and then separates the trash bag from the roll by tearing the line of perforations which connect it to the following bag of the roll.

It is known that edge-type wave-cut trash bags can be assembled overlapping dispensing on a roll in the same manner described [hereinabvoe] hereinabove in conjunction with conventional trash bags.

End-type wave-cut trash bags are manufactured by providing sets of closely spaced, parallel transversely extending seals at predetermined intervals along the length of a flattened blown-film polymeric tube. A transversely extending line of perforations is provided between the closely spaced, parallel seals. A wave or lobe-shaped line of perforations is formed across the flattened blown-film tube at a location equidistant between successive sets of spaced, parallel seals.

Figure[s] 6C is a diagrammatic illustration of a still later step in the process of the present invention;

Referring now to the Drawings, and particularly to Figures 1A, 1B, 2, and 3, there is shown a system 10 for implementing the process of assembling wave-cut trash bags for overlapping dispensing comprising the present invention. The system 10 receives a flattened blown-film polymeric tube 12 from a suitable source 14. The source 14 is illustrated in Figure 1A as comprising a coil from which the flattened blown-film polymeric tube 12 is directed into the system 10. However, as will be appreciated by those skilled in the art, the system 10 does not necessarily receive the flattened blown-film polymeric tube 12 from a coil; the system 10 may also receive the flattened polymeric film directly from the source 14 thereof.

The seals 22 may be formed [my] by positioning a heated bar on one side and a cooperating anvil on the opposite side of the flattened tube 12. The heated bar engages the flattened tube 12 under predetermined pressure thereby softening the material of the tube 12 sufficiently to form a permanent bond between the opposite sides thereof. The line of perforations 24 is formed by positioning a toothed bar and a cooperating anvil on opposite sides of the flattened tube 12. The tooth bar is advanced into engagement with the underlying anvil thereby forming the perforations comprising the line of perforations 24. As will be appreciated by those skilled in the art, various other procedures may be utilized to form the seals and/or the perforations comprising the seal/perforation zones 20.

Referring again to Figure 1A, the flattened blown-film polymeric tube 12 is directed from the bag machine 16 to a prefolding machine 26 which forms a first longitudinally extending fold in the flattened blown-film polymeric tube 12 whereby the tube 12 assumes a reduced width configuration. From the prefolding machine 26, the now once folded flattened blown-film polymeric tube 12 is directed to a wave cutting machine 28 which forms a lobe or wave-shaped line of perforations 30 in the tube 12. The wave-shaped line of perforations 30 is situated equidistant between adjacent seal/perforation zones 20 comprising the flattened blown-film polymeric tube 12.

The lobe or [wave shaped] wave-shaped line of perforations 30 may be formed by positioning a star wheel having a toothed periphery and an anvil wheel having a flat periphery on opposite sides of the flattened tube 12. The star wheel is advanced into engagement with the anvil wheel thereby initially perforating the flattened tube 12. While the star wheel and the anvil wheel remain in engagement, they are moved laterally across the width of the tube 12 following a curvilinear path thereby forming the lobe or [wave shaped] wave-shaped line of perforations 30. Other techniques for forming the lobe or [wave shaped] wave-shaped line of perforations 30 will readily suggest themselves to those skilled in the art.

Referring to Figures 2, 4, and 5, the winding machine 34 includes a perforation sensor 36 which is utilized to sense the lines of perforations 24 and the wave-shaped lines of perforations 30 as the flattened blown-film polymeric tube 12 moves through the winding machine 34 in the direction of the arrows 38. Referring specifically to Figure 4, the perforation sensor 36 may include signal generators 40 situated on opposite sides of the tube 12 as it moves through the winding machine 34. The signal generators 40 direct signals, which may comprise laser beams, infrared beams, or other types and kinds of electromagnetic signals into engagement with the outermost surfaces of the moving tube 12 and through the perforations formed therein. A signal receiving target 42 is positioned between the layers comprising the tube 12 as formed therein by the prefolding machine 26 and the V-folding machine 32 and is actuated by signals from the signal generators 40 passing through the perforations formed in the tube 12. In this manner each line of perforations 24 formed in the tube 12 is precisely identified.

Referring specifically to Figure 5, the perforation sensor 36 may instead comprise spark generators 44 situated on opposite sides of the tube 12 as it moves through the winding machine 34. The spark generators 44 direct signals, which comprise electric sparks into engagement with the outermost surfaces of the moving tube 12 and through the perforations formed therein. A signal

receiving target 46 is positioned between the layers comprising the tube 12 as formed therein by the prefolding machine 26 and the V-folding machine 32 and is actuated by signals from the spark generators 44 passing through the perforations formed in the tube 12. In this manner each line of perforations 24 formed in the tube 12 is precisely identified.

Having reference to Figures 2, 3, 6A, 6B, 6C, and 6D, the winding machine 34 further includes three sets of rollers 50, 52, and 54 which function to separate the flattened blown-film polymeric tube 12 into individual trash bags and to position the leading edge of each following trash bag in an overlapping relationship to the trailing end of the preceding trash bag. As is best shown in Figures 6A, 6B, 6C, and 6D, the rollers 50 and 52 form a separation 60 between the trailing end of each preceding bag and the leading end of each following bag comprising the flattened blown-film polymeric tube 12. Each trash bag comprising the tube 12 is formed into a semi-loop 62 as it passes between the rollers 52 and 54. Nozzles 64 produce downwardly directed air jets while nozzles 66 produce upwardly directed air jets. As the [gap] separation 60 between preceding and following trash bags enters the zone between the rollers 52 and 54, the air jets emanating from the nozzles 64 push the leading end of the following trash bag downwardly while the air jets emanating from the nozzles 66 push the trailing end of the



preceding trash bag upwardly. Meanwhile, the rollers 52 advance the leading end of the following trash bag into an overlapping relationship with the trailing end of the preceding trash bag thereby facilitating overlapping dispensing of the trash bags. From the rollers 52 the flattened blown-film polymeric tube 62 now having the leading end of each following trash bag positioned in an overlapping relationship with the trailing end of the preceding trash bag are directed to the winding mechanism 68 of the winding machine 34.

Referring to Figure 7, the perforations comprising the lines of perforations 24 of the seal/perforation zones 20 extending between adjacent trash bags comprising the flattened blown-film polymeric tube 12 are uniformly spaced. However, the lobe or waved-shaped lines of perforations 30 extending between adjacent trash bags comprising the tube 12 are arranged in accordance with a predetermined pattern in order to prevent skewing of the trash bags when they are separated one from another in the operation of the winding machine 34. For example, the perforations within the zone 70 of each line of perforation 30 may be closely and evenly spaced while the perforations comprising the zones 72 may be widely and/or non-uniformly spaced. Other perforation arrangements capable of preventing skewing of the trash bags when they are separated one from another will readily suggest themselves to those skilled in the art.

providing a [wave shaped] wave-shaped line of perforations extending across the entire width of the flattened blown-film polymeric tube at a location equidistant from each of the closely spaced, parallel sets of seals;

applying opposed axially directing forces to the flattened blown-film polymeric tube and thereby separating the trash bags comprising the flattened blown-film polymeric tube along each [wave shaped] wave-shaped line of perforations formed therein;

5. The process according to claim 1 wherein the [wave shaped] wave-shaped lines of perforations which are formed in the flattened blown-film polymeric tube to define the open ends of the trash bags comprising the flattened blown-film polymeric tube are arranged in accordance with a predetermined pattern which eliminates force concentrations when the opposed axially directed forces are applied to the flattened blown-film polymeric tube to separate the trash bags comprising the flattened blown-film polymeric tube along the [wave shaped] wave-shaped lines of perforations formed therein.

A process for assembling wave-cut trash bags for overlapping dispensing includes the steps of providing a flattened blown-film polymeric tube; providing sets of closely spaced, parallel seals extending across the entire width of the flattened blown-film polymeric tube at periodic intervals [there along] therealong; providing a transversely extending line of perforations between the seals comprising each set of closely spaced, parallel seals; and providing a [wave shaped] wave-shaped line of perforations extending transversely across the entire width of the flattened blown-film polymeric tube at a location equidistance between adjacent closely spaced, parallel sets of seals. The flattened blown-film polymeric tube is separated along each transversely extending line of perforations and along each wave shaped line of perforations after which the leading end of each following trash bag is positioned in an overlapping relationship with the trailing end of the preceding trash bag to facilitate overlapping dispensing.